

IN THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1 (Previously Presented): A fuel cell system having: a fuel cell generating power as a result of chemical reactions between supplied gases, wherein a coolant flows in the fuel cell and undergoes a temperature increase as a result of absorbing waste heat produced by power generation in the fuel cell; a water tank; a humidifying device for humidifying at least one supplied gas by using water from the water tank; and a coolant temperature regulation device for regulating a temperature of the coolant flowing inside the fuel cell so as to control the temperature of the fuel cell;

the fuel cell system comprising:

a defrosting device for melting ice in the water tank by applying heat of the coolant to the water tank;

a coolant recirculation passage for allowing a recirculation of the coolant through the defrosting device and the fuel cell;

a flow generator for generating a flow of the coolant from the fuel cell to the defrosting device; and

a controller for controlling a startup operation of the fuel cell system, the controller having the function of controlling the flow generator to generate a flow of coolant from the fuel cell to the defrosting device so as to melt ice in the water tank while the startup operation of the fuel cell system.

2 (Previously Presented): The fuel cell system as defined by Claim 1, wherein the defrosting device is disposed in the water tank and comprises a heat exchanger allowing heat exchange between the coolant and ice in the water tank.

3 (Previously Presented): The fuel cell system as defined by Claim 2, further comprising a heater for heating the coolant discharged from the defrosting device.

4 (Previously Presented): The fuel cell system as defined by Claim 3, further comprising a temperature sensor for detecting a temperature of the coolant;

wherein the coolant temperature regulation device comprises:

a radiator provided on the coolant recirculation passage;

a first bypass passage branching from the coolant recirculation passage and bypassing the radiator, the heater being disposed in the first bypass passage; and

a passage switching device for selectively switching the passage for the coolant between a passage passing through the radiator and a passage passing through the first bypass passage;

and wherein the controller further functions to control the passage switching device in response to a detected temperature of the coolant so as to regulate the temperature of the coolant.

5 (Previously Presented): The fuel cell system as defined by Claim 4, wherein the water tank is disposed in the coolant recirculation passage upstream of the position at which the first bypass passage branches from the recirculation passage.

6 (Previously Presented): The fuel cell system as defined by Claim 3, further comprising a temperature sensor for detecting a temperature of the fuel cell;

wherein the controller further functions to compare the detected temperature of the fuel cell with freezing point of water; operate the heater when the detected temperature of the fuel

cell is less than freezing point; and stop the operation of the heater when the detected temperature of the fuel cell is greater than or equal to freezing point.

7 (Previously Presented): The fuel cell system as defined by Claim 2, further comprising:
a second bypass passage branching upstream of the water tank and bypassing the water tank; and

a passage switching device for switching the passage for the coolant between a passage passing through the heat exchanger in the water tank and a passage passing through a second bypass passage.

8 (Previously Presented): The fuel cell system as defined by Claim 7, further comprising a temperature sensor for detecting a temperature of the fuel cell,

wherein the controller further functions to compare the detected temperature of the fuel cell with freezing point of water; control the passage switching device so that the coolant flows through the second bypass passage when the detected temperature of the fuel cell is less than freezing point; and control the passage switching device so that the coolant flows through the heat exchanger in the water tank when the detected temperature of the fuel cell is greater than or equal to freezing point.

9 (Previously Presented): A fuel cell system having: a fuel cell generating power as a result of chemical reactions between supplied gases, wherein a coolant flows in the fuel cell and undergoes a temperature increase as a result of absorbing waste heat produced by power generation in the fuel cell; a water tank; a humidifying device for humidifying at least one supplied gas by using water from the water tank; and a coolant temperature regulation device for regulating a temperature of the coolant flowing inside the fuel cell so as to control the temperature of the fuel cell;

the fuel cell system comprising:

a defrosting means for melting ice in the water tank by applying heat of the coolant to the water tank;

a coolant recirculation passage means for allowing a recirculation of the coolant through the defrosting means and the fuel cell;

a flow generating means for generating a flow of the coolant from the fuel cell to the defrosting means; and

a control means for controlling the flow generator to generate a flow of coolant from the fuel cell to the defrosting means so as to melt ice in the water tank while a startup operation of the fuel cell system.

10 (Previously Presented): A control method for controlling a fuel cell system, the fuel cell system having: a fuel cell generating power as a result of chemical reactions between supplied gases, wherein a coolant flows in the fuel cell and undergoes a temperature increase as a result of absorbing waste heat produced by power generation in the fuel cell; a water tank; a humidifying device for humidifying at least one supplied gas by using water from the water tank; and a coolant temperature regulation device for regulating a temperature of the coolant flowing inside the fuel cell so as to control the temperature of the fuel cell;

the control method comprising the steps of:

providing a defrosting device for melting ice in the water tank by applying heat of the coolant to the water tank;

providing a coolant recirculation passage for allowing a recirculation of the coolant through the defrosting device and the fuel cell; and

generating a flow of coolant from the fuel cell to the defrosting device so as to melt ice in the water tank while a startup operation of the fuel cell system.

11 (New): The fuel cell system as defined by Claim 4, further comprising a temperature sensor for detecting a water temperature in the water tank;

wherein the controller is operable to start the heater when the detected water temperature in the water tank is less than or equal to freezing point of water.

12 (New): The fuel cell system as defined by Claim 11, wherein the heater is a heat exchanger integrated with a catalytic combustor and an electrically heated catalyst for increasing the temperature of gases supplied to the catalytic combustor, the heat generated by the catalytic combustor being applied to the coolant by the heat exchanger,

wherein the controller functions to start the heater by applying current to the electrically heated catalyst when the detected water temperature in the water tank is less than or equal to freezing point of water.

13 (New): The fuel cell system as defined by Claim 12, further comprising a temperature sensor for detecting a temperature in the electrically heated catalyst;

wherein the controller functions to start the flow generator and to allow a passage of the coolant through the first bypass passage, when the detected temperature in the electrically heated catalyst is greater than or equal to a first predetermined temperature.

14 (New): The fuel cell system as defined by Claim 4, wherein the controller functions to control the passage switching device to allow the passage for the coolant passing through the radiator when the detected temperature of the coolant is greater than or equal to a second predetermined temperature.

15 (New): A vehicle comprising the fuel cell system as defined by Claim 1.